

Patent claims

1. A system for the automatic application of self-adhesive protective film to specific parts of vehicle bodies,
 - having a plurality of workstations arranged one after another in the system,
 - having a horizontal conveying device which conveys the vehicle parts to be treated through the workstations, with which the vehicle bodies can be brought to a standstill in each of the workstations in order to carry out certain amounts of work, in each case in a defined working position,
 - having at least one pair of industrial robots - hereinafter called "application robots" for short - arranged in mirror-image fashion in relation to each other on this and the other side of the horizontal conveying device in at least one of the workstations for the joint handling and application of one piece of film in each case during the processing of the latter - a workstation equipped in this way is hereinafter called an "application station" for short,
 - having devices for the defined holding of a supply roll in each case and for drawing off pieces of protective film from a supply roll by means of an application robot, and also having a device for cutting off the piece of film drawn off from the supply roll,
 - furthermore having a device for accurate-contour drawing of specific perforation lines in a piece of film held stretched out,characterized by the whole having the following features:
 - two separate application stations (9, 10) are provided in the system, of which one application station (10) contains two pairs (13a, b and 14a, b) and the other (9) contains one pair (12a, b) of industrial robots (12a, b; 13a, b; 14a, b) arranged opposite one another for the joint handling and application of one piece of film (24) in each case,
 - the base element (15) of each application robot (12a, b; 13a, b; 14a, b) is arranged in a fixed location, that is to say immovably with respect to the conveying direction of the horizontal conveying device (8), in the respective application station (9, 10), beside the position of the associated body part (2, 3, 4) which the application robot

- (12a, b; 13a, b; 14a, b) has to process and which said body part assumes when the body (1) is at a standstill,
- the supply rolls (22, 22', 22'') which are in use and arranged in the application system are - as seen in outline - arranged laterally beside the horizontal conveying device (8) with the roll axis oriented parallel to the conveying direction, the supply rolls (22, 22', 22'') which are in use - in relation to the conveying direction of the horizontal conveying device (8) - being arranged at different points, specifically at the point of the respectively associated application robots (12a, 13a, 14a),
 - the device for the accurate-contour drawing of perforation lines in a piece of film held stretched out comprising a perforation tool (60) which is held stationary, along which the piece of film (24) held stretched out jointly by the two opposite application robots (12a, b; 13a, b; 14a, b) can be moved in accordance with the contour of the desired perforation lines.
2. The application system as claimed in claim 1, characterized in that the supply roll (22, 22', 22'') which is in use, including the associated cutting device (41), is in each case arranged within the application tool (18, 18', 18'') of one (12a; 13a; 14a) of the two application robots (12a, b; 13a, b; 14a, b) of an associated pair of robots, and in that the opposite application robot (12b; 13b; 14b) of this pair of robots (12a, b; 13a, b; 14a, b) contains a suction strip (50) as an important constituent part of the corresponding application tool (19, 19', 19'').
3. The application system as claimed in claim 2, characterized in that within the workspace which can be reached by the working arm (16) of each application robot (12a; 13a; 14a) provided with a supply roll (22, 22', 22'') there is arranged a magazine (21, 21', 21'') for a plurality of supply rolls (22, 22', 22''), in which the supply rolls (22, 22', 22'') are mounted in such a way that they can be transferred automatically into the robot tool (18, 18', 18'') of the application robot (12a; 13a; 14a).

4. The application system as claimed in claim 2, characterized in that in each case a supply roll (22, 22', 22'') contains the film needed for about 100 to 200 application procedures.
5. The application system as claimed in claim 2, characterized in that each supply roll (22, 22', 22'') is provided with a core (23) made of a cheap material, such as hard paperboard or plastic.
6. The application system as claimed in claim 2, characterized in that the supply roll (22, 22', 22'') which is in use can be fixed (31) against film being drawn off.
7. The application system as claimed in claim 1, characterized in that the width (B, B', B'') of the supply rolls (22, 22', 22'') corresponds to the length (L, L', L'') measured in the body longitudinal direction of the respectively associated body part (2, 3, 4) to be stuck.
8. The application system as claimed in claim 1, characterized in that the perforating wheel (64) provided in the perforating tool (60) held so as to be stationary is mounted such that it can pivot about a (pivot axis 61) at right angles to the plane of the stretched-out piece of film (24) and is provided with a pivoting drive (62, 63), which is integrated into the programmable control system of the pair of application robots (12a, b; 13a, b; 14a, b) as a further movement axis and which always aligns the plane of the perforating wheel (64) tangentially with respect to the contour of the desired perforation lines at the current perforation point.
9. The application system as claimed in claim 8, characterized in that the perforating tool (60) held so as to be stationary and mounted rotationally is arranged with the pivot axis (61) oriented vertically and with the row of perforation teeth (65) pointing downwards, under which the piece of film (24) held and handled jointly by the pair of opposite application robots (12a, b; 13a, b; 14a, b) can be moved along in a horizontal attitude, following the contour of the desired perforation lines.

10. The application system as claimed in claim 1, characterized in that the application station (9) is provided with only one pair of opposite application robots (12a, b) for the application of a piece of film (24) corresponding to the roof area (2) of the body (1).
11. The application system as claimed in claim 1, characterized in that the application station (10) is provided with two pairs of opposite application robots (13a, b; 14a, b) for the application in each case of a piece of film (24) corresponding to the hood area (3) and the rear panel area (4), respectively.
12. The application system as claimed in claim 1, characterized in that a device (51) for the application of a narrow self-adhesive edge securing tape is integrated into the robot tool (19', 19'') of the application robot (13a, b; 14a, b) having the suction strip (50), with which tape it is possible to stick over the edges of the film located at the front in the direction of travel of the body (1) in the roof regions (2) and hood region (3).